

EXHIBIT

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**IN THE UNITED STATES DISTRICT COURT
FOR THE NORTHERN DISTRICT OF ALABAMA
SOUTHERN DIVISION**

IN RE BLUE CROSS BLUE SHIELD	:
ANTITRUST LITIGATION	: Master File 2:13-cv-20000-RDP
MDL 2406	:
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	:
	: This document relates to
	: Subscriber Track cases

DECLARATION OF DR. ARIEL PAKES

I, Ariel Pakes, declare:

1. I am the Thomas Professor of Economics in the Department of Economics at Harvard University where I teach courses in Industrial Organization, the Economics of the Health Care Industry, and Econometrics. I received a Bachelor of Arts and a Masters of Arts with distinction from Hebrew University in 1971 and 1973, respectively. I received a Masters of Arts and a Ph.D. from Harvard University in 1976 and 1979, respectively. I received the Frisch Medal of the Econometric Society in 1986 and was elected as a fellow of that society in 1988. I was elected to the American Academy of Arts and Sciences in 2002 and to the National Academy of Sciences in 2017. I was the Distinguished Fellow of the Industrial Organization Society in 2007 and was appointed a Distinguished Fellow of the American Economic Association in 2019. I received the Jean Jaques Laffont Award (for research that combines economic theory and empirical work) in 2017 and the BBVA Frontiers of Knowledge in Economics Management and Finance Award in 2018. In 2020 I became Clarivate Web of Science Citation Laureate. My curriculum vitae is attached as Appendix A.

2. I previously submitted class certification and merits expert reports in this matter on behalf of the Subscriber Plaintiffs. A summary of my class certification report (“Damage Report”) can be found at ECF No. 2411-1.

3. I have been asked by Settlement Class Counsel to apply the methodologies I used to calculate estimated damages within Alabama in those reports to obtain an estimate of the damages for the nationwide Damages Class identified in the Settlement Agreement.

4. To do so, I apply the percentage changes in margins I found in my Damage Report. The report analyzed the effect of a Blue from one service area entering a neighboring service area; the specific territory I analyzed for entrance was the state of Alabama. By margin, I mean premium

minus insurance claims divided by premiums. That is, the margin is the fraction of premiums that did not go to covering the direct payments the health insurer made to health care providers.

5. My analysis considers a range of hypothetical different possible entry scenarios for potential entry (non-Blue-branded or Blue-branded) in the absence of the challenged rules, including the following:

- that there would have been entry in all states
- that there would only have been entry in states where the local Blue is “dominant”, where dominant is defined as having a market share of fifty per cent or more,
- that there would have only been entry in states where Anthem Blue Cross operated in a neighboring state, and
- that there would only have been entry in states where a Blue was dominant and where Anthem operated in a neighboring state

6. The calculation for the subset of states which had Anthem Blue Cross as a neighbor was made for two reasons. First, as discussed extensively in my report, Anthem has historically demonstrated a desire to expand outside of its exclusive service area. Second, as also discussed extensively in my report, Blues that neighbor a market are likely to find it less costly and more lucrative to enter that market.

7. My report does not contain an analysis of entry into the ASO market. However, I understand that the damages from restricting entry into the ASO market from 2015 to 2019 has been determined as a reasonable estimate to be 6.5% of total damages. As a result, I used that fraction to estimate damages to ASOs (or Self-Funded Accounts as the term is used in the Settlement Agreement).

8. **The data that went into the calculations.** To apply my estimates to the different subsets of markets, I require premiums and claims costs by segment, rating area, and year from 2008 to 2019 in the fully insured market. To the extent possible these numbers were taken from

reports made to NAIC (the National Association of Insurance Commissioners).¹ The NAIC data is only available from 2010 to 2018. We use the Bureau of Labor Statistic's producer price index's component index for Direct Health and Medical Insurance Carriers and the 2010 and 2011 premiums and claims data to predict (or "backcast") premiums and claims costs for 2008 and 2009. We make an analogous forward looking forecast for 2019.

9. **Results.** Total damages are presented in Table 1. The damages calculated in the first two rows of these two tables are just for the counterfactual where the FI market is impacted by entry. The third row provides the damages that resulted from the restrictions in the ASO market between 2015-2019 calculated as described above.

Table 1

Total Damages					
Market	Period	Damages (\$ bil.)			
		All states	Dominant	Anthem Neighbor	Dominant & Neighbor
FI	2008-2013	17.5	14.8	10.1	8.7
	2014-2019	16.2	14.1	9.9	8.7
ASO	2015-2019	2.3	2.0	1.4	1.2
Total		36.1	30.9	21.4	18.6

10. **Conclusion.** Depending on the entry scenario, damages nationwide for the Damages Class over the Settlement Class Period are estimated to range from \$18.6 billion to \$36.1 billion.

¹ Some adjustments were made to ensure the data used were appropriate for the study. There are states with Blues that were only very partially engaged in the market, and we did not want to count such "fringe" insurers as creating damages due to market dominance, so we omitted possible damages from Blues with market shares of less than 5%. We also omitted data on states where reported margins were either negative or greater than one, on the grounds that this was likely a result of reporting errors.

I declare under penalty of perjury the foregoing is true and correct.

A handwritten signature in black ink, appearing to read "Ariel Pakes", written over a horizontal line.

Ariel Pakes
October 30, 2020
Cambridge, MA

Appendix A

Ariel Pakes

Curriculum Vita

August 30, 2020

Personal

Academic Address:

Department of Economics
Harvard University
Littauer, Room 117
Cambridge MA, 02138

Contact Information

Office Telephone: (617) 495-5320
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E-mail: apakes@fas.harvard.edu
Web site: <http://scholar.harvard.edu/pakes>

Home Address:

215 Brattle Street
Cambridge, MA 02138
Telephone: (617) 945-1203
Citizenship: Dual U.S. and Canadian
Married to: Juliana Rojas Pakes. Two children.

Education

Degrees

Ph.D. Harvard University, June 1979.
M.A. Harvard University, 1976.

M.A. The Hebrew University of Jerusalem, June 1973, with distinction.

B.A. The Hebrew University of Jerusalem, June 1971.

Thesis Topic

Economic Incentives in the Production and Transmission of Knowledge: An Empirical Analysis.

Primary Fields (in alphabetical order)

Econometrics, Industrial Organization, Productivity and Technological Change.

Employment

- Mark and Sheila Wolfson Visiting Professor, Stanford University, Spring 2018.
- Trione Visiting Professor, Stanford University, Spring 2015.
- Thomas Professor of Economics, Department of Economics, Harvard University, July 2005 to present.
- Visiting Professor NYU, 2005/2006 academic year.
- Professor of Economics, Department of Economics, Harvard University, July 1999 to July 2005.
- Visiting Professor, Department of Economics, Harvard University, Spring 1999.
- Visiting Professor, Department of Economics, University of Chicago, Fall 1998.
- Charles and Dorothea Dilley Professor of Economics, Yale University, 1997 to 1999.
- Professor of Economics, Yale University, 1988 to 1997.
- Associate Professor (with tenure), Department of Economics, University of Wisconsin-Madison, 1986 to 1988.

- Associate Social Science Research Institute, 1986 to 1988.
- Visiting Research Associate, Economic Growth Center, Yale University, Fall, 1985.
- Senior Lecturer in Economics (with tenure), The Hebrew University of Jerusalem, 1984 to 1986.
- Visiting Assistant Professor, Department of Economics, University of Wisconsin, Madison, 1984-1985.
- Lecturer in Economics, The Hebrew University of Jerusalem, 1980 to 1984.
- Lecturer in Economics, Harvard University, 1979.

Honors and Awards

From Academies or Societies.

- Selected as a Web Of Science, Citation Laureate, 2020. The article cited was "Automobile Prices in Market Equilibrium" which was joint with Steve Berry and Jim Levinsohn, and published in *Econometrica* in 1995.
- Elected as a fellow of the International Association of Applied Economists, 2019.
- Appointed a Distinguished Fellow of the American Economic Association, 2019.
- BBVA Frontiers of Knowledge Award in Economics, Finance and Management, 2018. (joint with Robert Porter and Tim Bresnahan). Citation: "*Motivated by important and policy-relevant questions in applied economics they developed methodologies that had a significant and long-lasting impact on subsequent work in industrial organization as well as other applied fields*".
- Elected to the National Academy of Sciences, 2017.

- Recipient of the 2017 Jean-Jacques Laffont Prize. Citation: *Awarded annually and recognizes an internationally renowned economist whose research is in the spirit of Professor Jean-Jacques Laffont's work, and combines both theory & empirics.*
- Industrial Organization Society Distinguished Fellow, 2007.
- Elected Fellow of the American Academy of Arts and Sciences, 2002.
- Elected Fellow of the Econometric Society, 1988.
- 1986 recipient of the Frisch Medal. Citation: *Awarded every two years by the Econometric Society for the best applied article, empirical or theoretical, published in the journal Econometrica over the past five years.* The Article receiving the award was; "Patents as Options: Some Estimates of the Value of Holding European Patent Stocks".

Additional Distinctions awarded papers.

- Recipient of the 2017 Robert F. Lanzillotti Prize for the Best Paper in Antitrust Economics awarded at the IOE, for Asker J., Fershtman C., Jeon J., Pakes A.; The Competitive Effects of Information Sharing.
- Finalist: Best paper award. American Health Care Research Annual award. Paper receiving the award was: Kate Ho and Ariel Pakes (2014) "Hospital Choices, Hospital Prices and Financial Incentives to Physicians," *American Economic Review*.

Fellowships.

- Harvard University Honorary Fellow. Academic Years 1974-78.
- Canada Council Doctoral Fellowship. Academic Years 1974-78.
- Eliezer Kaplan Fellowship for Research in the Social Sciences, 1971-73.

Named Lectures.

- Keynote Speaker, Conference on Structural Dynamic Modeling, Chicago, July 2019, "Experience Based Equilibria and Information Sharing in Procurement Auctions".

- The Arrow Lecture, The Institute of Advanced Studies, Jerusalem, July 2018; "Learning and Equilibrium in a New Market".
- The Fathauer Lecture in Political Economy, University of Arizona, March 2018, "From Models of Firm Behavior to the Analysis of Market Outcomes."
- Keynote Speaker: AIPOC, Auckland New Zealand, December 2017, "Just Starting Out: Learning and Equilibrium in a New Market."
- Keynote speaker: ERMAS, Cluj-Napoca, Romania, July 2017, "Dynamics in I.O.: An Equilibrium Concept and a Procurement Example."
- Keynote speaker: CESifo Area Conference on Applied Microeconomics, Munich, March 2017, "Just Starting Out: Learning and Equilibrium in a New Market."
- Inaugural Griliches lectures; The Asian Meetings of the Econometric Society, Kyoto, August, 2016, "Moment Inequalities: When and How to Use Them."
- Keynote Speaker, North American Productivity Workshop, Quebec City, June 2015, "Just Starting Out: An Empirical Examination of Firms' Learning Equilibrium Strategies."
- Keynote Speaker, Cresse Conference on Advances in the Analysis of Competition Policy and Regulation, Crete, July 2015, "The Analysis of Dynamic Responses."
- Plenary Speaker, 16th CEPR Conference on Applied Industrial Organization, Zurich, May 2015, "Methodological Issues in The Analysis of Market Dynamics."
- Keynote Speaker, The International Society for Dynamic Games and Applications, Amsterdam, July 2014, "Dynamic Analysis of Market Outcomes."
- The Cowles Lecture, Summer Meetings of the Econometric Society, Minneapolis, June 2014, "Dynamic Analysis of Market Outcomes: A Methodological Issue."

- Keynote Speaker, Barcelona Summer Forum, Barcelona, June 2014, “Dynamic Analysis of Market Outcomes.”
- Keynote Speaker, North American Productivity Workshop, Ottawa, June 2014, “Hospital Choices, Hospital Outcomes, and Financial Incentives to Physicians.”
- Keynote Speaker, French Econometric Society, Toulouse, November 2013, “Inequalities for Semi-parametric Multinomial Choice with Fixed Effects”.
- Lawrence R. Klein Lecture, University of Pennsylvania, Philadelphia, April 2013, “Behavioral and Descriptive Forms of Econometric Models.”
- Keynote Speaker, EARIE (European Association for Research in Industrial Economics), Rome, August 2012, “Models for Dynamic Oligopolies.”
- The Sargan Lecture, The Royal Economic Society, Cambridge England, March 2012, “Interpretable Reduced Forms.”
- Keynote Speaker, CEPR conference, Tel Aviv, May 2011, “Dynamic Games with Asymmetric Information.”
- Keynote Speaker, The Spanish Industrial Organization Society Annual Meeting, Vigo, Spain, October 2009, “Simplifying Applied Work.”
- The Fukuzawa Lecture, The Far Eastern and South Asian Meeting of the Econometric Society, Tokyo, August 2009, “Simplifying the Assumptions in Applied Work: A Static and a Dynamic Example.”
- The Fiftieth Anniversary of the Rotterdam Econometrics Institute, Rotterdam, May 2006. “The Future of Econometrics: Some Econometric Problems in Applied I.O.”
- The Fisher-Schultz Lecture, the World Congress of the Econometric Society, London, August 2005, “Econometrics and Theory in Applied I.O.”
- Plenary Lecture, Conference in tribute to Jean Jacques Laffont, Toulouse, France, July 2005, “An Overview of Developments in Applied I.O.”

- The PIER lecture, The University of Pennsylvania, February 2005, “Nash and Econometrics.”
- Keynote speaker, The Society for Economic Dynamics Annual Meeting, Florence, Italy, July 2004, “Applied Analysis in Dynamic I.O.: Problems and Prospects.”
- Keynote Speaker, CEPR Conference, Hydra, Greece, May 2004, “Competitive Analysis of Mergers.”
- The Marshall Lectures, Cambridge, England, January 2004, “Models of Markets for Applied Work.”
- The Fishelson Lecture, Tel Aviv, January 2004, “Advances in Demand Analysis.”
- Keynote Speaker, First International Industrial Organization Conference, Boston, MA, April 2003, “Simplicity and Sensibility: Notes on the Econometrics of Industrial Organization.”
- The Journal of Applied Economics Invited Lectures, Kingston, Ontario, June 2002, “Demand Analysis in Characteristic Space.”
- The Richard T. Ely Lectures, John Hopkins University, Baltimore, Maryland, November 2001, “Dynamic Analysis in I.O.”
- Invited Plenary Lecture, EARIE (European Association for Research in Industrial Economics), Dublin, Ireland, July 2001, “A Framework for Dynamic Analysis in Applied I.O.”
- Invited plenary lecture, European meetings of the Econometric Society, Berlin 1998, “Simple Dynamic I.O. Models for Applied and Empirical Work.”
- Invited plenary lecture to the Society for Computational Economics, Geneva 1995, “Computational Problems In The Empirical Analysis of Some Simple I.O. Models.”
- Invited Lecture to the World Congress of the Econometric Society, Barcelona 1990, “Dynamic Structural Models: Problems and Prospects.”

Professional Activities.

NSF Panels.

Member and report co-author, special NSF panels for:

- Global Change, 1990.
- Computational Economics, 1991.
- Data Opportunities, 1993.

Other NSF Panels.

- NSF Presidential Fellow Advisory Panel, 1992.
- NSF Economics Advisory Panel, 1989, 1990.

Panels on Economic Modeling in Antitrust.

- American Bar Association, "Merger Analysis", Washington DC, 2000.
- Association of Competition Economists, "Upward Pricing Pressure", Norwich, United Kingdom, 2014
- Cornerstone Health Care Panel, "Vertical Markets", Washington DC, 2016.
- Cornerstone Merger Panel, "Innovative Industries", London, 2018.
- Brattle Structural Analysis in Antitrust, "Structural Models in Antitrust", New York, 2018.

Other Panels

- Israel Council for Research and Development: Overseeing the integration of Census and *R&D* Surveys to create a panel on research performing firms in Israeli Industry.
- Member, Council for Research on Income and Wealth, 1994 to date.
- Member, Census Advisory Panel, 1995 to 2000. Co-chair of panel 1999.
- Israel Ministry of Education, the Council for Higher Education; Panel to assess the strengths of the economics departments at universities in Israel. Summer 2008.

Graduate and Post-Doctoral Students.

A list of Ariel Pakes' sixty three graduate students together with their initial placement, and his two post doctoral fellows is downloadable from his home page. Many of these students are now employed at major research universities.

Formal Associations with Research Institutes.

- Scientific Board: The UBB Institute for Advanced Study in Science and Technology, Cluj-Napoca, Romania, 2017-.
- Chair of the Scientific Board: The Toulouse School of Economics, 2019-present; member of board 2015-18.
- Scientific Board: Center for Study of Auctions, Procurement, and Competition Policy, Penn State, 2006-2011.
- Fellow Toulouse Network for Studies in Industrial Organization, 2004-2008.
- Fellow Center for Microdata Methods and Practice (CEMMAP), London 2005-present.
- Board of Directors: the Networks, Electronic Commerce, and Telecommunications Institute (NET) 2003-2017.
- Fellow, Harvard University Center for the Environment, 2000 to present.
- Research Associate, National Bureau of Economic Research, 1983 to present.
- Member Cowles Commission, 1997 to present.
- Faculty Research Fellow, National Bureau of Economic Research, 1979 to 1983.
- Research Associate, The Maurice Falk Institute for Economic Research in Israel, 1980 to 1986.

Other Formal Associations.

-Founding Editorial Board: *Microeconomic Insights*. A blog to explain the implications of findings from microeconomic research. Launched in January 2016.

Responsibility for Programs at Conferences.

- Program Director (with Eric Maskin and Elchanan Ben-Porat), Institute of Advanced Studies, Jerusalem, July 2018; Summer School for Economic Theory.
- Chair, World Congress of the Econometric Society, Montreal, August 2015.
- NSF/NBER CEME conference in Econometrics, New York, August 2012.
- NBER Summer Institute, Industrial Organization, July 2012.
- American Economic Association, Winter Meeting, 2005.
- NBER Summer Institute, Industrial Organization and Productivity, 2002.
- Econometric Society, Summer Meeting, Maryland, 2000.
- Cowles Foundation, Conference on Structural Modeling, 2000.

- NBER, Productivity, Fall 1997, 1999.
- NBER, Recent Advances in Models of Supply and Demand, July, 1996.
- American Economic Association, Winter Meeting, Anaheim, 1992.
- NBER, Structural Models of Firm and Industry Behavior, annual, July 1992, July 1991, July 1990, July 1989, July 1988, July 1987.
- World Congress of the Econometric Society, Barcelona, 1990.
- Econometric Society Winter Meetings, Washington, December 1990.
- Econometric Society Winter Meetings, New York, December 1988.
- NBER, Technical Change and *R&D* Incentives, August 10-12, 1983.

Committees

Past Yale University Committees.

Divisional Committee for the Social Sciences.

Committee on Cooperative Research (patent and copyright policy).

Harvard University.

Committee for Business Economics

Committee for Health Economics

American Academy for Arts and Sciences.

Committee for the Nomination of Fellows (twice).

American Economic Association.

AEA Honors and Award Committee 2015 to present

Census Advisory Panel

Standing Committee of Economic Statistics

Econometric Society.

Council member: Econometric Society, 2015 to present

Chair of Program Committee: 2015 World Congress (Montreal).

Frisch Prize Committee (twice).

Walras-Bowley Lecture Committee (twice)

Committee for the Election of Fellows.

Japanese Econometric Society.

Nakahara Prize Committee, 2016.

Editing.

- Associate Editor, the *Proceedings of the National Academy of Sciences*, 2018 to the present.
- Guest Editor, *Journal of Marketing Research*, Special issue on dynamic choice, 2012.
- Board of Editors, *American Economic Journal*, Micro, 2007 to 2012.
- Associate Editor, *Journal of the European Economics Association*, 2003 to 2010.
- Editor, *The RAND Journal of Economics*, January 1999 to 2009.
- Associate Editor, *Journal of Econometrics*, 1996 to 1999.
- Co-editor (with K. Sokoloff), *Proceedings of the National Academy of Sciences*, special issue on “Science, Technology, and the Economy”, 1996.
- Co-editor (with M. Fuss and R. Gronau), *Journal of Econometrics*, (Annals of Econometrics Issue), 1995.
- Advisory Editor, *Economics Letters*, 1993 to 2018.
- Associate Editor, *Economics Letters*, 2018 to date.
- Associate Editor, *Journal of Economic Dynamics and Control*, 1993 to 2006.
- Associate Editor, *Econometrica*, 1989 to 1995.
- Associate Editor, *International Journal of Industrial Organization*, 1989 to 1995.
- Associate Editor, *Economics of Innovation and New Technology*, 1989, to 1994.

Grants

Commonwealth Fund:

Prices, Incentives and Provider Consolidation in Health Care with Kate Ho and Mark Shepard (2015).

National Science Foundation:

(2000) Issues in the Applied Analysis of Markets. Three years.

(1998) Special Creativity Extension, “Empirical Implementation of Some

Simple I.O. Models” Two year extension.

(1995) Accomplishment Based Grant, “Empirical Implementation of Some Simple I.O. Models.” Three years.

(1991) “Equilibrium Models of the Auto Industry” (joint with Steve Berry and Jim Levinsohn).

(1989) “Dynamic Models of Firm and Industry Behavior” (joint with Rick Ericson).

(1986) “The Behavior of Small Science Based Firms” (joint with Rick Ericson).

Binational Science Foundation:

(2013) “Collusion in Auctions” (joint with John Asker and Chaim Fershtman).

(2009) “Dynamic Games with Asymmetric Information” (joint with Chaim Fershtman).

(1995) “A Framework for the Empirical Analysis of Cartels and Price Wars”, (joint with Chaim Fershtman, two years).

(1981) “Science Based Industry in Israel” (joint with Zvi Griliches).

Organization for Economic Cooperation and Development

(1998) “Patent Data and the National Accounts” (two year grant, joint with Jenny Lanjouw).

Environmental Protection Agency Research

(1992) “Regulation, the Environment and the Automobile Market” (two year grant joint with Steve Berry and Sam Kortum).

Israel National Council of Research and Development

(1981) “Science Based Industry in Israel: Development of a Data Set, and an Analytic Framework.”

Binational Agricultural Science Foundation

(1983) “Science Based Agroindustry: The Emergence of New Firms” (joint with Zvi Eckstein and Bob Evenson).

Written Lectures to Broader Professional Groups:

- The Jean Jacques Laffont Lecture “From Theory to Empirical Work; Modern I.O.” Toulouse, October 2017.
- The Basic Econometrics of Demand Systems, (with Aviv Nevo) the NBER, July 2012.
- Association for Competition Economics, Norwich England, November

2010. Also at office of the Director General, Competition Authority, European Union, Brussels, May 2011

– “Upward Pricing Pressure Screening in the New Merger Guidelines”.

- Industry Canada, “Productivity and Innovation in Canada”, Montreal, November, 2006.
- The American Bar Association, Antitrust Law Task Force on Time, Change, and Materiality: “Economic Analysis of Merger Activity,” July 2001.
- The National Academy of Science Panel on the Cost of Living Index: “Hedonics and Price Indices,” January 2000.
- Federal Reserve Board Meeting, 1999: “Answers to Some Questions on Productivity Trends”.
- Bogen Lecturer, The Hebrew University: “Economic Models for Antitrust Analysis”, Jerusalem, December, 1997.
- National Academy of Sciences Symposium on Science and the Economy, Irvine, California, “Hedonic Cost Functions for Automobiles and the Costs of Fuel Efficiency,” October, 1995.
- Senate Finance Committee, the United States Congress, “Biases in the CPI,” April 6, 1995.
- National Academy of Sciences Symposium: “Technology and the Economy.” Organizer and chair of session in Washington, April 1994.
- American Academy for the Advancement of Science Symposium, “Data Needs for the 21st Century: Industrial Organization and Productivity,” Boston, Mass, February, 1993.
- NASA-NOAA-NSF conference on Global Warming; “Environmental Policy and Technological Change: Questions for Further Research.” New Haven, CT, April, 1990.

- Symposium Directed to Members of Israeli and European Science Policy Establishments. Organized by the Israel's National Council of Research and Development at Kiryat Anavim (Israel, June 1984); "Science Based Industry in Israel: A look at the Data."
- Symposium Directed to Israeli Industrialists and Members of Scientific Establishment. Organized by Maurice Falk Institute for Economic Research in Israel at the Hebrew University of Jerusalem (1982). "Measuring the Contribution of Research and Development to Industrial Development."
- "New Economic Tools for Merger Analysis," at Symposium on Economists' Perspectives on Antitrust (for lawyers and their consultants), Charles Rivers Associates, Boston, April, 1977.

Lecture Series for Students and Faculty in Foreign Countries:

- Econometric Society Summer School in Dynamic Structural Econometrics, Chicago, 2019.
- Institute for Advanced Studies, Jerusalem, June 2018.
- CEMFI, Madrid, August 2016
- Shanghai School of Finance and Economics, Shanghai, 2015
- Ecores, Brussels, Belgium, 2015
- CEMFI, Madrid, Spain, 2011
- Geneva, Switzerland, 2007
- Rotterdam, Holland, 2006
- Stockholm, Sweden, 2006
- Helsinki, Finland, 2005
- Fontainebleau, France, 2003
- Pisa, Italy 2002
- Tel Aviv, Israel, 2001
- Bertinoro, Italy, 2000
- Gerzensee, Switzerland, 1999
- Lisbon, Portugal, 1997
- The Nike Lectures, Amsterdam, 1995

Lecture Series for Government Employees:

- Joint series for the Federal Trade Commission and the Department of Justice, November 2001 “The Analysis of Mergers with Differentiated Products.”
- Series for the Bank of Italy, September 2001, “Industrial Organization, Pricing Equations, and Productivity.”
- Spanish Civil Service and University Professors, June, 2005, 2006, 2007, 2008, 2009 “Topics in IO and Productivity”.

Publicly Available Computer Programs:

A. Pakes, G. Gowrisankaran, and P. McGuire, 1993, “The Pakes-McGuire Algorithm for Computing Markov Perfect Equilibria,”
(downloadable at <http://aida.econ.yale.edu/ariel/pmgnew>).

Published Articles.

Articles Published in Journals.

- Ariel Pakes and Zvi Griliches (1980) “Patents and *R&D* at the Firm Level: A First Report,” *Economics Letters*, 5(4): 377-381.
- Benjamin Eden and Ariel Pakes (1981) “On Measuring the Variance-Age Profile of Life-Time Earning,” *Review of Economic Studies*, 48(3): 385-394.
- Ariel Pakes (1982) “On the Asymptotic Bias of Wald-Type Estimators of a Straight Line when both Variables are Subject to Error,” *International Economic Review*, 23(2): 491-497.
- Ariel Pakes (1983) “On Group Effects and Errors in Variables in Aggregation,” *The Review of Economics and Statistics*, 65(1): 168-173.
- Ariel Pakes and Shmuel Nitzan (1983) “Optimal Contracts for Research Personnel, Research Employment and the Establishment of ‘Rival’ Enterprises,” *Journal of Labor Economics*, 1(4): 345-365.
- Ariel Pakes and Zvi Griliches (1984) “Estimating Distributed Lags in Short Panels with an Application to the Specification of Depreciation

Patterns and Capital Stock Constructs,” *Review of Economic Studies*, 51(2): 243-262.

- Ariel Pakes (1985) “On Patents, R&D, and the Stock Market Rate of Return,” *Journal of Political Economy*, 93(2): 390-409.
- Mark Schankerman and Ariel Pakes (1985) “Valeur et obsolescence des brevets: Une analyse des statistiques de renouvellement des brevets européens,” *Revue Economique*, 36(5) ENSAE, Paris, September, 917-941).
- Ariel Pakes (1986) “Patents as Options: Some Estimates of the Value of Holding European Patent Stocks,” *Econometrica*, 54(4): 755-784.
- Mark Schankerman and Ariel Pakes (1986) “Estimates of the Value of Patent Rights in European Countries During the Post-1950 Period,” *Economic Journal*, 96(384): 1052-1076.
- Ariel Pakes (1987) “Mueller’s Profits in the Long Run,” *Rand Journal of Economics*, 18(2): Summer, 319-332.
- Laurence J. Kotlikoff and Ariel Pakes (1988) “Looking for the News in the Noise: Additional Stochastic Implications of Optimal Consumption Choice,” in *Annales, D’Economie et de Statistique*, (ENSAE, Paris), no. 9: 29-46.
- Ariel Pakes and David Pollard (1989) “Simulation and the Asymptotics of Optimization Estimators,” *Econometrica*, 57(5): 1027-1057.
- Ariel Pakes and Margarette Simpson (1989) “Patent Renewal Data,” *Brookings Papers on Economic Activity, Microeconomic Annual*, 331-401.
- Zvi Griliches, Bronwyn Hall, and Ariel Pakes (1990-1991) “R&D, Patents, and Market Value Revisited: Is There a Second Technological Opportunity Factor,” *Economics of Innovation and New Technology*, 1(3): 183-201.
- Ariel Pakes, Steve Berry, and Jim Levinsohn (1993) “Applications and Limitations of Some Recent Advances in Empirical Industrial Organization: Price Indexes and the Analysis of Environmental Change,” *A.E.R.*, Papers and Proceedings, 83(2): 240-246.

- Steve Berry and Ariel Pakes (1993) “Some Applications and Limitations of Recent Advances in Empirical Industrial Organization: Merger Analysis,” *A.E.R.*, Papers and Proceedings, 83(2): 247-252.
- with David Kendrick (editor) *et. al.*(1993) “Research Opportunities in Computational Economics,” *Computational Economics*, 6-3: 257-315.
- Ariel Pakes and Paul McGuire (1994) “Computing Markov-Perfect Nash Equilibrium: Numerical Implications of a Dynamic Differentiated Product Model,” *RAND Journal of Economics*, 25(4): 555-589.
- Melvyn Fuss and Ariel Pakes (1995) “Editors’ Introduction,” *Journal of Econometrics* (Annals of Econometrics Issue), 65(1): 1-8.
- Ariel Pakes and Steve Olley (1995) “A Limit Theorem for a Smooth Class of Semiparametric Estimators,” *Journal of Econometrics* (Annals of Econometrics Issue), 65(1): 295-332.
- Richard Ericson and Ariel Pakes (1995) “Markov-Perfect Industry Dynamics: A Framework for Empirical Work,” *Review of Economic Studies*, 62(1): 53-82.
- Steve Berry, Jim Levinsohn, and Ariel Pakes (1995) “Automobile Prices in Market Equilibrium,” *Econometrica*, 63(4): 841-890.
- Steve Olley and Ariel Pakes (1996) “The Dynamics of Productivity in the Telecommunications Equipment Industry,” *Econometrica*, 64(6): 1263-1297.
- Ariel Pakes and Kenneth Sokoloff (1996) “Science, Technology, and Economic Growth: Introduction,” *Proceedings of the National Academy of Sciences*, 93(23): 12655-12657.
- Steve Berry, Sam Kortum, and Ariel Pakes (1996) “Environmental Change and Hedonic Cost Functions for Automobiles,” *Proceedings of the National Academy of Sciences*, 93(23): 12731-12738.
- Ariel Pakes and Richard Ericson (1998) “Empirical Implications of Alternative Models of Firm Dynamics,” *Journal of Economic Theory*, 79(1): 1-45.

- Jenny Lanjouw, Ariel Pakes, and Jonathan Putnam (1998) “How to Count Patents and Value Intellectual Property: The Uses of Patent Renewal and Application Data,” *Journal of Industrial Economics*, 46(4): 405-432. (Originally prepared for the OECD conference on New Indicators for the Knowledge-Based Economy, Paris, June, 1996.)
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